SPECTROSCOPY WITH COMB-REFERENCED DIODE LASERS

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Extended cavity diode lasers have been stabilized by locking to components of an erbium-doped fiber laser-based frequency comb with a 250 MHz comb spacing centered at $1.5\mu m$. We find the Allan variance of the diode laser frequency relative to the single comb component to which it is locked is of the order of a few Hz. For the system as a whole, the absolute frequency accuracy is approximately 1.5 parts in 10^{12}. In order to characterize the system more completely, we have recorded saturation dip absorption spectra of several transitions in the $\nu_1 + \nu_3$ combination band of acetylene near 6530 cm^{-1}. We find good agreement with published absolute frequency measurements for these transitions, which have been used as secondary frequency standards in the past. Aside from extremely precise saturation dip measurements such as these, comb-stabilized lasers should permit excellent measurements of Doppler-broadened lineshapes, both to compare with theory and for analytical applications. Progress along these lines will be reported at the meeting.

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